

Patent Claims

1. Connection device for the pivotable and captive connection of a control lever (1) and an associated support element (6) of a valve controller of an internal combustion engine,
wherein the control lever (1) exhibits a calotte-shaped recess (5) in a supporting section (3), with the spherical end (7) of the support element (6) being located in said recess,
wherein an undercut (8) is provided below the spherical end (7) in the support element (6),
wherein the control lever (1) exhibits a spherical top side (4) in the supporting section (3) above the calotte-shaped recess (5),
and wherein a retaining element (9) connects the control lever (1) and the support element (6),
with the retaining element (9) exhibiting a U-shaped cross-sectional geometry with an upper and a lower leg (10, 11) which are connected to each other by a connecting section (12),
and wherein geometrically closed openings (13, 14) are provided in the two legs (10, 11) to receive the undercut (8) of the support element (6) or the spherical upper side (4) of the supporting section (3) of the control lever (1),

with the opening (13) in the upper leg (10) being essentially round and the opening (14) in the lower leg (11), associated with the support element (6), being essentially slot-shaped.

2. Connection device according to claim 1, **characterized in that** the control lever (1) is designed as a cam follower.

3. Connection device according to claim 1, **characterized in that** the support element (6) is designed as an axially movable piston.

4. Connection device according to claim 1, **characterized in that** the retaining element (9) exhibits a material thickness below the axial width of the undercut (8) so that this retaining element is freely movable in all pivot positions of the control lever (1) in the undercut.

5. Connection device according to claim 4, **characterized in that** the legs (10, 11) and the connecting section (12) of the retaining element (9) are smooth-surfaced.

6. Connection device according to any of the preceding claims, **characterized in that** the legs (10, 11) of the retaining element (9) exhibit lead-in chamfers (17, 18, 19, 20) in the area of their free ends (15, 16).

7. Connection device according to any of the preceding claims, **characterized in that** the free ends (15, 16) of the legs (10, 11) point away from each other.

8. Connection device according to any of the preceding claims, **characterized in that** the opening (14) in the lower leg (11) exhibits a stadium-like geometry, with two parallel opening sections being connected via semi-circular opening sections.

9. Connection device according to claim 8, **characterized in that** a slot-like extension (21, 22) of the opening (14) is provided in the lower leg (11) at at least one of the semi-circular opening sections.

10. Connection device according to any of the preceding claims, **characterized in that** the opening (13) in the upper leg (10) is of such size that this leg is securely supported on the spherical top side (4) of the supporting section (3) of the control lever (1).

11. Connection device according to claim 10, **characterized in that** the width (D2) of the opening (14) in the lower leg (11) at a right angle to its longitudinal extension is smaller than the diameter (D1) of the opening (13) of the upper leg (10).

12. Connection device according to any of the preceding claims, **characterized in that** the width (D2) of the opening (14) in the lower leg (11) at a right angle to its longitudinal extension is smaller than the diameter of the support element (6) above and below the undercut (8).

13. Connection device according to any of the preceding claims, **characterized in that** the upper leg (10) is axially shorter than the lower leg (11).

14. Connection device according to any of the preceding claims, **characterized in that** the connection radius between the lower leg (11) and the connecting section (12) is smaller than the connection radius between the connecting section (12) and the upper leg (10).

15. Connection device according to any of the preceding claims, **characterized in that** the distance between the lower leg (11) and the upper leg (10) near the connecting section (12) is greater than in the area of the free end (15, 16) of the two legs (10, 11).